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New York Power Authority

Michael J. Colomb
Site Executive Officer

April 13, 1998
JAFP-98-0126

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

Subject: **Docket No. 50-333**
LICENSEE EVENT REPORT: LER-97-005-01

Manual Reactor Scram Due to Failure of the Number 3 Turbine Control Valve

Dear Sir:

This report is submitted in accordance with 10 CFR Part 50.73(a)(2)(IV), "Any event or condition that resulted in a manual or automatic actuation of any engineered safety feature (ESF), including the reactor protection System (RPS)".

This revised Licensee Event Report is being submitted to include additional corrective actions.

There are no commitments contained in this report.

Questions concerning this report may be addressed to Mr. Gordon J. Brownell at (315) 349-6360.

Very truly yours,

MICHAEL J. COLOMB

MJC:GJB:las
Enclosure

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cc: USNRC, Region 1
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SUBJECT: Forwards LER 97-005-01 re manual reactor scram due to failure of number 3 turbine control valves.Revised LER submitted to include addl corrective actions.

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APPROVED BY OMB NO. 3150-0104
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LICENSEE EVENT REPORT (LER)

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TITLE (4)

Manual Reactor Scram Due to Failure of the Number 3 Turbine Control Valve

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	05000
05	25	97	97 --	005 --	01	04	13	98	N/A	05000

OPERATING MODE (9): N

POWER LEVEL (10): 70

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		10 CFR 21

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Mr. Gordon J. Brownell, Licensing Engineer	(315) 349-6360

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
A	JJ	FCV	G080	N					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 24, 1997 at 2102 hours, operators commenced a reactor shutdown from 100 percent power due to number three Main Turbine Control Valve (TCV-3) failing in the fully opened position. Power level was reduced and maintained at approximately 70 percent while unsuccessful attempts were made to close the valve. At 0456 hours on May 25, 1997, operators initiated a manual reactor scram followed by a manual turbine trip to support a reactor shutdown while maintaining reactor pressure control.
Following the manual scram, a Primary Containment Isolation System (PCIS) Group II isolation occurred (Reactor Building Ventilation System isolation, and initiation of the Standby Gas Treatment System trains A and B) on low reactor water level.

The TCV failure was the result of a damaged valve spring can coupling. The cause for the damaged coupling was identified as a result of improperly installed bolting material.

Corrective actions included valve spring can coupling bolt replacement on the four TCVs and the four Combined Intermediate Valves (CIVs).

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EIIS Codes are in []

EVENT DESCRIPTION

On May 24, 1997 at approximately 1326 hours with the plant operating at 100 percent power, the Control Room received a half scram annunciation from Reactor Protection System (RPS) [JE] trip system "A". Simultaneous with the half scram signal, operators noted an abnormal noise from outside the Control Room, however, no other indications for the cause of the half scram signal were present. Investigation into the cause of the half scram continued and it was noted that the Control Room was receiving conflicting data as to position indication for Main Turbine Control Valve (TCV) [JJ] number three. All other plant parameters were unchanged and normal for 100 percent power operation.

An operator was dispatched to the Turbine Control Valve area to investigate the cause for the valve position indication discrepancy. Initial visual inspection identified broken valve actuator bolting material located in the general area of TCV-3. Further reviews identified the material as broken TCV push rod spring housing coupling bolts which allowed the springs to bottom out in the spring housing. Since the control system feedback is connected to the spring assembly, this resulted in zero valve position indication in the Control Room and to the control system, which caused the control valve to be driven to the full open position.

At 2105 hours on May 24, 1997, operators commenced a reactor shutdown by reducing power to approximately 70 percent. This power level was chosen to provide adequate pressure control with the remaining operable TCVs, and allow margin to fully close TCV-3.

Maintenance, Engineering, and Operations Departments made preparations to complete a slow closure of TCV-3 in support of further power reduction, however, attempts were unsuccessful. Because the valve could not be closed, operators determined that a manual scram, immediately followed by a manual Main Turbine [TA] trip, was the most prudent course of action to safely shutdown the reactor while maintaining reactor pressure control.

Main Turbine Stop Valves [SB] were tested as a precautionary measure. Operators were briefed on their various duties, stationed at the appropriate locations, and at 0456 hours on May 25,1997, a manual scram was inserted, immediately followed by a manual turbine trip. Abnormal Operating Procedure AOP-1, "Reactor Scram" was entered in support of Control Room activities.

A chronological sequence of events leading up to and immediately following the manual scram is presented below.

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DESCRIPTION (Cont.)

May 24, 1997

1326 hours	Control Room received an RPS half scram signal on trip system A. Control Room operators reported hearing a loud noise outside of Control Room.
1335 hours	Reset RPS trip system A.
1339 hours	Control Room operators observed conflicting data regarding TCV-3 position indication.
1426 hours	Investigation into cause for TCV-3 position indication discrepancy identified valve spring can coupling damaged.
1800 hours	Maintenance engineer inspection of damaged TCV-3 determined that valve had failed in the fully opened position.
1800 hours	Decision was made to commence a plant shutdown.
1800 - 2000	Plant management discussed plant shutdown methods and hours begin preparations for plant shutdown. It was determined that if TCV-3 could be closed, that remaining three (3) TCVs would provide reactor pressure control during a normal plant shutdown.
2000 - 0200	Plant conducts consultation and development of a hours Temporary Operating Procedure to support closure of TCV-3.
2105 hours	Commence reactor shutdown.
2145 hours	Reactor power reduced to approximately 70 percent power.

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DESCRIPTION (Cont.)

May 25, 1997

0320 hours	Attempts to close TCV-3 were unsuccessful, valve would not close.
0425 hours	Completed surveillance testing of Main Turbine Stop Valves in support of manual scram initiation.
0456 hours	Inserted manual scram, entered AOP-1. Main Turbine manually tripped. Reactor water level lowered to less than 177 inches above top of active fuel (TAF), a Group II Primary Containment Isolation System (PCIS) actuation occurred (Reactor Building Ventilation System [VA] isolated, and initiation of Standby Gas Treatment System [BH] trains A and B), entered Emergency Operating Procedure EOP-2, "RPV Control".
0457 hours	Reactor water level restored to greater than 177 inches. All control rods verified in. Reactor Feedwater [SJ] Pump turbines tripped on high reactor water level (222.5 inches).
0501 hours	Main Turbine Bypass valves controlling reactor pressure at 906 psig.
0503 hours	Reactor scram reset.
0510 hours	Restarted Reactor Feedwater Pump B, reactor water level returned to normal.
0518 hours	Exited EOP-2.
0535 hours	Restored Reactor Building Ventilation, secured Standby Gas Treatment Systems A and B.
0720 hours	Commenced a Reactor coolant system cooldown in accordance with Operating Procedure OP-65, "Startup and Shutdown".
1845 hours	Reactor placed in the cold condition.

CAUSE OF EVENT

Operator actions to initiate a manual reactor scram at approximately 70 percent power were the result of the failure of the number 3 Turbine Control Valve in the fully opened position.

The condition leading to the valve failure was determined to be a damaged spring can coupling. Specifically, ten (10) valve push rod spring housing coupling bolts were found broken, the remaining two had pulled out of the spring guide. This permitted the spring to release and come in contact with the bottom of the spring housing and accounted for the loud noise heard by Operations personnel. Since the control system feedback is connected to the spring assembly, there was a resulting zero valve position indication to the control room and to the control system, which caused the control valve to be driven to the full open position. This accounted for the conflicting valve position data received in the Control Room.

Following the plant shutdown, an equipment failure evaluation (EFE) was conducted on all 12 spring housing coupling bolts. The results of the analysis determined that the failure of the coupling bolts was due to high fatigue caused from dynamic loading, and a loose coupling joint.

The EFE concluded that the following causes attributed to the failed condition:

1. Use of incorrect length bolting material during a previous valve actuator reassembly (exact installation date could not be determined.) The use of the four incorrect size bolts resulted in preventing four of the twelve fasteners from initially carrying any coupling load.

2. Inadequate valve reassembly practices. This condition was evidenced by the use of the incorrect length bolting material and the lack of a specified bolt torque requirement.

3. Per the response to GE TIL 1162-3R1, bolt inspections for the TCV's were scheduled for refuel outage 12, as recommended in the TIL. The plant where the original failure had occurred was contacted. Fitzpatrick's TCV #4 bolts (which are the most susceptible to dynamic loading, analogous to the previous industry failure) were inspected in refuel outage 12 and showed no signs of degradation, however, Maintenance did not take the next step to ensure a quality coupling joint by inspecting the spring guide thread condition (although not specifically called out by the TIL) or inspecting bolts of the other TCV's.

   The TCV maintenance procedure was revised to provide specific guidance during valve disassembly and reassembly activities per the TIL and to specify spring housing coupling bolt torque requirements based on additional information received from contacting the original plant.

CAUSE OF EVENT (cont.)

4. Increased cycling of TCV-3 during pressure regulator testing associated with recent power uprate testing following completion of Refuel Outage #12. This testing placed additional dynamic loading, not normally encountered, on an already degraded component.

The cause for the Group II PCIS isolation signal was the reactor water level lowering to less than 177 inches above TAF following the manual reactor scram due to the rapid lowering of reactor power from the rapid insertion of control rods.

ANALYSIS

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(iv), "any event or condition that resulted in a manual or automatic actuation of an engineered safety feature (ESF) including the reactor protection system (RPS)".

The Primary Containment Isolation System is an engineered safety feature. The isolation of the Reactor Building Ventilation System and initiation of the Standby Gas Treatment System (Group II isolation) on a low reactor water level signal are features designed to mitigate the consequences of a postulated loss of coolant accident (LOCA) inside the drywell. Both systems operated as designed and were restored to normal operating conditions following the event.

The four Main Turbine Control Valves are provided to regulate steam to the turbine, within the capability of the reactor to supply steam, thereby controlling reactor pressure. The TCVs are hydraulically opened and spring to close valves located in the Turbine Building.

The post transient evaluation revealed that the Shift Manager demonstrated conservative decision-making in manually scramming the plant when faced with a potential loss of reactor pressure control. Operator control of reactor power, level, and pressure following the scram was adequate. Operators implemented all Abnormal Operating Procedure (AOP) and Emergency Operating Procedure (EOP) steps appropriately.

This event is bounded by the previously analyzed Main Turbine trip with bypass system operation as described in the FitzPatrick Updated Final Safety Analysis Report (UFSAR). The plant responded as described following the manual scram from approximately 70 percent of rated power. There were no challenges to the reactor coolant pressure boundary or the cladding integrity. Therefore, the safety significance of this event was minimal.

CORRECTIVE ACTIONS

1. An equipment failure evaluation was completed on the valve spring can coupling assembly to determine the cause for the failure of the twelve coupling bolts.

2. TCV-3 was repaired, ensuring proper thread engagement.

3. Spring can coupling bolting on the remaining three TCVs were removed and examined. Only one valve (TCV-1) contained all five inch length bolts, the remaining two control valves contained both five inch and five and one-half inch length bolts. As a preventive measure, all coupling bolts were replaced on the remaining three valves with new five inch bolts. Additionally, during the bolt exchange, the thread conditions for the upper spring guide were examined with no significant problems identified. Similar bolting material was also replaced on all Combined Intermediate Valves.

4. The spring guide located on TCV-3 is scheduled to be replaced during the plants next Refuel Outage.

5. An entry was made into the Nuclear Plant network to inform other plants of the Control Valve failure and its causes.

6. A review was completed of recent turbine generator GE TILs and Operating Experience Evaluations to determine if a similar problem could exist to preclude a similar failure scenario. Twenty TILs and forty operating experience reports were reviewed and determined not to have the potential for a similar failure scenario.

7. The Engineering Support Personnel (ESP) Training Program Review Committee completed a review of this event summary and Lessons Learned. An ESP training module was developed and presented in 1997. Included in this training were Lessons Learned and knowledge gained as a result of the inaccurate assumptions and conclusions made during the Operating Experience reviews associated with this event.

8. Historical maintenance records/data associated with the previous turbine control valve number 3 maintenance did not contain coupling bolt information. Therefore, the circumstances leading to the incorrect length bolting material could not be determined. The Authority is, however, confident that the work control processes and practices currently in place at JAF would prevent recurrence of this type event. The Maintenance Department will utilize the Lessons Learned from this experience to improve future turbine maintenance contractor oversight.

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ADDITIONAL INFORMATION

A. Previous Similar Events:

In reviewing industrial experience, it was found that a similar event occurred at another nuclear station when a coupling failed following valve testing. This event became the source of General Electric Company Technical Information Letter (TIL) 1162-3R1,"Nuclear Control Valve and Combined Intermediate Valve Push Rod-Spring Couplings" which identified the failure of Control Valve push rod-spring housing coupling bolts.

B. Failed Component Identification:

Component Description	Main Turbine Control Valve
Component ID	94TCV-3
System	Main Turbine System
Manufacturer	General Electric Co
NPRDS Manufacturers Code	G080